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09/980,443	08/08/2002	Hong Lye Oh	851663.432USPC	3555

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EXAMINER	
HUBER, JEREMIAH C	

ART UNIT	PAPER NUMBER
2621	

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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	09/980,443	OH ET AL.	
	Examiner	Art Unit	
	Jeremiah C. Huber	2621	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *25 June 2007*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-23* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-23* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *5/13/1999* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Petition

Applicant's petition for withdrawal of the finality of the rejection of the last Office action is persuasive and, therefore, the finality of that action is withdrawn.

Claim Rejections - 35 USC § 102

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

2. Claims 1-2, 4-5, 7-8, 10, 16, 18 and 20 are rejected under 35 U.S.C. 102(b) as being anticipated by Morgan et al (GB2308774).

In regard to claim 1 Morgan discloses a method for motion estimation for use in a moving pictures sequence wherein data representing the picture in the sequence comprises a plurality of data blocks (Morgan Fig. 1) that includes:

selecting a group of related data blocks from the plurality of related data blocks of the picture (Morgan page 8 line 33 to page 9 line 7);

for each data block in the selected group obtaining a corresponding block motion vector from a previously processed picture in the moving pictures sequence (Morgan page 8 line 33 to page 9 line 19 note motion vector generated for each block from the point of maximum correlation);

classifying the block motion vectors from the selected group into a plurality of sub-groups (Morgan pgs. 13 line 24 to pg. 15 line 13 particularly note pg. 15 lines 5-13 motion vectors are classified according to co-ordinate value).

determining a primary and a plurality of secondary global motion vectors corresponding to block motion vectors (Morgan page 9 line 31 to page 10 line 25 and page 13 line 24 to page 16 line 5 note identifying motion vectors with highest count and meeting other criteria as global motion vectors also motion vector with highest count is primary because it is most representative of all motion vectors in the frame); and

selecting the primary and or secondary motion vectors for use in defining one or more search windows for each block in the selected group to enable block matching with a reference picture (Morgan page 10 line 24 to page 11 line 8 note each selected vector will be tested for correlation).

In regard to claim 2 refer to the statements made in the rejection of claim 1 Morgan further grouping by a spatial clustering technique (Morgan pg. 15 lines 5-14 note sub-groups are determined by the pg, 15 lines 14-19 note global motion vectors correspond to multiple sub-groups for which motion vectors are similar).

In regard to claim 4 refer to the statements made in the rejection of claim 1 above. Morgan further discloses determining a match between each block in the selected group and a matching block in one or more search windows for that block in the reference picture and determining a computed motion vector between each block in the selected group and its matching block (Morgan page 10 line 26 to page 11 line 8).

In regard to claim 5 refer to the statements made in the rejection of claim 4 above. Morgan further discloses storage of motion vector data (Morgan page 15 lines 6 –14).

In regard to claim 7 refer to the statements made in the rejection of claim 1 above. Morgan further discloses analyzing the distribution of global motion vectors and selecting a motion estimator scheme on the basis of a distribution metric (Morgan page 10 line 26 to page 11 line 8 note that the search pattern will differ for each block depending on motion vectors that are selected to be tested also note page 12 line 31 to page 13 line 8 global MV's are selected based on frequency of use also note pg 16 lines 25-28 global vectors may be selected based on spatial distribution).

In regard to claim 8 refer to the statements made in the rejection of claims 1 and 7 above.

In regard to claim 10 refer to the statements made in the rejection of claims 1 and 8 above.

In regard to claim 16 refer to the statements made in the rejection of claims 1 and 8 above.

In regard to claim 18 refer to the statements made in the rejection of claims 1 and 10 above.

In regard to claim 20 refer to the statements made in the rejection of claim 1 above. As stated in claim 1 above the primary global motion vector is the motion vector with the highest count, while secondary motion vectors are those with lower counts. Therefore a secondary global motion vector necessarily depends on the primary global

motion vector because if the secondary motion vector must have a lower count. Further, initial secondary global motion vectors will inherently be determined when evaluating the first frame. Morgan further discloses updating global motion vectors based on block motion vectors classified into the corresponding sub-group (Morgan pg. 15 lines 5-13).

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

4. Claim 3 is rejected under 35 U.S.C. 103(a) as being unpatentable over Morgan in view Horne (5473379).

In regard to claim 3 refer to the statements made in the rejection of claim 1 above. Morgan further discloses that secondary GMV's are the average of their corresponding sub-group (Morgan pg. 15 lines 5-13 note all vectors in sub-group have the same co-ordinate value as the secondary GMV). It is noted that Morgan does not disclose the use of a primary global motion vector that is the average of all motion vectors in the selected group. However Horne discloses a motion compensation apparatus where a global motion vector is determined to be the average of all of the motion vectors used in the previous frame (Horne fig. 4 and col. 12 line20 to col. 13 line 55 note col. 12 lines 20-28). It is therefore considered obvious that one of ordinary skill

in the art at the time of the invention would recognize the advantage of including a global motion vector as taught by Horne, in the set of global motion vectors of Morgan in order to improve motion compensation techniques as suggested by Horne (Horne col. 10 lines 46-49).

5. Claims 6, 9, 17 and 19 are rejected under 35 U.S.C. 103(a) as being unpatentable over Morgan in view of Yagasaki et al (5428396).

In regard to claims 6, 9, 17 and 19, Morgan discloses a motion estimation method as argued in the rejection of claims 1, 8 and 10 above. Morgan further discloses processing based on motion vector length (Morgan page 14 line 21 to page 15 line 4). It is noted that Morgan does not disclose details of variable length coding (VLC). However, Yagasaki discloses a method VLC for motion vectors that adapts to optimally fit a given range of motion vectors (Yagasaki col. 8 line 26 and col. 9 line 8). It is therefore considered obvious that one of ordinary skill in the art at the time of the invention would recognize the advantage of including in Morgan a VLC coding method as taught by Yagasaki in order to reduce space necessary to store the video data.

6. Claims 11-12 and 14 are rejected under 35 U.S.C. 103(a) as being unpatentable over Morgan in view of Krause et al (5093720).

Morgan discloses a motion estimation method as stated in the rejection of claims 1 and 8 above. It is noted that Morgan does not disclose details of multiple motion estimators. However Krause discloses a video processing system that comprises plural

motion estimators in order to estimate motion for both of the previous odd and even fields in relation to the current field (Krause Figs 3-4 and col. 4 line 52 to col. 5 line 7). It is therefore considered obvious that one of ordinary skill in the art would recognize the advantage of modifying the single field block matching of Morgan to include plural motion estimators to compare a current field to both of the previous even and odd fields as taught by Krause in order to improve compression efficiency as taught by Krause (Krause col. 5 lines 1-7).

In regard to claim 12 refer to the statements made in the rejection of claim 11 above. Morgan discloses a means for determining a maximum search range on the basis of the global motion vector (Morgan pg. 14 line 15 to pg. 15 line 13 note 'long' vector threshold sets maximum search range allowed for a global motion vector).

In regard to claims 14 refer to the statements made in the rejection of claims 1 and 8 above.

7. Claims 13 and 15 are rejected under 35 U.S.C. 103(a) as being unpatentable over Morgan in view of Krause as applied to claim 11 above, and further in view of Yagasaki.

The modification of Morgan in view of Krause does not disclose details of variable length coding (VLC). However, Yagasaki discloses a method VLC for motion vectors that adapts to optimally fit a given range of motion vectors (Yagasaki col. 8 line 26 and col. 9 line 8). It is therefore considered obvious that one of ordinary skill in the art at the time of the invention would recognize the advantage of further modifying

Morgan in view of Krause to include a VLC coding method as taught by Yagasaki in order to reduce space necessary to store the video data.

In regard to claim 15 refer to the statements made in the rejection of claims 11 and 13 above.

Claims 21-23 are rejected under 35 U.S.C. 103(a) as being unpatentable over Morgan in view Vector Quantization in Speech Coding (VQSC) and in further view of Golin (6058143).

In regard to claims 21-23 refer to the statements made in the rejection of claim 1 above. Morgan discloses a method of determining and selecting global motion vectors and using the global motion vectors to determine a block matching motion estimation search window scheme. It is noted that Morgan does not disclose assigning each block motion vector to a closest global motion vector. However, the classifying process described in claim 21 is a well known classification algorithm known as a k-means clustering as demonstrated in VQSC. VSQC discloses a k-means algorithm in which data is assigned to the nearest cluster center (VQSC pg. 1557 note k-means step 2). VSQC further discloses details of initializing the cluster centers (VSQC pgs. 1557, 1579 note K-means step 1), and updating cluster centers (VQSC pg. 1557 note K-means step 3) and repeating classification with updated cluster centers (VQSC pg. 1557 note K-means step 4). Further, Golin discloses that it was well known to apply such clustering techniques in order to obtain motion vector candidates in video coding (Golin col. 5 lines 49-57). It is therefore considered obvious that one of ordinary skill in the art at the time

of the invention would recognize the advantage of utilizing the well known k-means clustering technique to determine some of the global motion vectors in Morgan in order to determine the best representative motion vector of closely grouped motion vectors as suggested by Golin (Golin col. 5 lines 49-57).

Response to Arguments

8. Applicant's arguments with respect to claims 3, 11-15 and 20 have been considered but are moot in view of the new ground(s) of rejection.

Applicant's arguments filed 5/23/2007 have been fully considered but they are not persuasive.

In response to the applicant's arguments made in regard to claim 1, the applicant asserts that Morgan fails to disclose determining secondary global motion vectors (GMV) corresponding to respective sub-groups. Instead the applicant argues that Morgan merely selects the 8 most common GMV's. The examiner must disagree. Morgan discloses obtaining motion vectors used in encoding a previous frame and grouping the motion vectors by motion vector co-ordinate value (Morgan pg. 15 lines 5-14). The applicant seems to assert that grouping must encompass more than vectors of the same co-ordinate value, however such limitation appear in the claims. The claims merely recite that a group of motion vectors are classified into a plurality of sub-groups, the examiner believes that grouping motion vectors by co-ordinate value meets this limitation. Morgan also discloses that global motion vectors will be the vector with the same co-ordinate value as the most commonly occurring vectors. Therefore the global

motion vectors will correspond to their respective subgroup. Morgan further discloses that the global motion vectors must differ from each other by a certain threshold (Morgan 435 and page 15 lines 14-17). Therefore, the global motion vectors do not necessarily represent only the 8 most common sub-groups, but rather represent a set of similar sub-groups. This method of selecting motion vectors seems to correspond with the applicants specification on page 14 lines 10-12 that discloses using most common vectors among groups as global motion vectors.

In response to the applicant's arguments made in regard to claim 7 the applicant asserts that Morgan fails to disclose selecting between plural motion estimation and search schemes. The examiner must disagree. Morgan discloses a motion vector selector 230 which selects a motion vector to apply to a particular block (Morgan pg. 10 line 26 to pg. 11 line 8). The selector functions by testing the correlation between blocks of the current and previous images according to the motion vectors (Morgan pg. 11 lines 2-3). The test blocks define areas of a frame to be searched for matching blocks or a matching block search window. Further, the selector can receive various combinations of global, local and neighboring motion vectors based on the characteristics of the motion vectors (Morgan col. 10 lines 17-25). Specifically based on whether or not the motion vectors pass a confidence test (Morgan pg. 10 lines 16-17). Based on which motion vectors are selected the motion vector selector will test various areas of current and previous images. Therefore employ different block matching search window schemes because the search pattern defined by the test blocks will change as various motion vectors are selected. The examiner believes that this meets employing various

combinations of motion vectors and matching block search window schemes as defined by the claim. If the applicant desires a more specific definition of any of the claimed terms it should be included in the claim.

In response to the applicant's argument made in regard to claim 8, in addition to the assertion that Morgan does not disclose the features of claim 7 the applicant further asserts that Morgan fails to disclose selecting motion estimator schemes based on a metric representing a distribution pattern of global motion vectors. The examiner must disagree. As stated in the rejection and arguments made in regard to claim 1 Morgan discloses determining a frequency metric for each global motion vectors. Morgan further discloses that global motion vectors are used by the motion vector selector, which will alter the search area pattern in accordance with the motion vectors received (Morgan pg. 10 line 17 to pg. 11 line 8). Therefore, the examiner believes that Morgan discloses selecting a motion estimator scheme on the basis of a distribution pattern metric as defined by the claim.

In response to the applicant's arguments made in regard to claim 18 the applicant asserts that Morgan fails to disclose determining secondary global motion vectors from the block motion vectors classified in the respective sub groups. The examiner must disagree. Morgan discloses classifying block motion vectors based on the particular vector co-ordinate value . The most common motion vector co-ordinate values are can be selected as GMV's (Morgan pg. 15 lines 5-28). Thus the GMV is determined from the sub-group because it will have the same co-ordinate value as the sub-group from which it originates.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Jeremiah C. Huber whose telephone number is (571)272-5248. The examiner can normally be reached on Mon-Fri 8:00 a.m. - 4:30 p.m..

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Mehrdad Dastouri can be reached on (571)272-7418. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Jeremiah C Huber
Examiner
Art Unit 2621

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